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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/988,417	11/16/2001	Ralf Bohnke	282452US8X	8530

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EXAMINER	
KIM, KEVIN	
ART UNIT	PAPER NUMBER
2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	04/20/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/20/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	09/988,417	BOHNKE ET AL.	
	Examiner	Art Unit	
	Kevin Y. Kim	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 January 2007*.

2a)☐ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-15,17-20 and 24-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5-8,14,15,18-20 and 24-28* is/are rejected.

7)☒ Claim(s) *2-4,9-13,17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed January 29, 2007 have been fully considered but they are not persuasive.

Applicant argues that the Espax et al patent only adjusts subcarriers of probed sub-bands and thus fails to teach applying weighting value to each of the plurality of subcarriers as claimed. However, the patent teaches that the reason to apply the same weight adjustment for each sub-band rather than for every selected sub-carrier is to keep the transmission overhead low. See col.6, lines 21-25. The patent goes so far as suggesting that only a sub-band containing the most badly affected sub-carriers could be processed, obviously at the expense of lower quality signal transmission. From this, one can easily see the reason that those sub-bands containing sub-carriers having poor quality are identified for transmitting probing signals on those selected sub-carriers rather than simply transmitting probing signals on all the sub-carriers. The latter would have produced better quality signals, but at an increased transmission overhead. By disclosing an improved method of applying weights to sub-carriers at a reduced transmission overhead, the patent implicitly teach or at least suggest measuring the channel response of all the sub-carriers and applying weights to each of the sub-carriers.

Examiner does not agree with the applicant's analysis of the Greenstein et al patent. Applicant argues that they would be only two pilot tones because the second pilot tone is selected for the tones outside of the correlation bandwidth. However, the patent clearly describes a plurality of pilot tones within the correlation bandwidth. See col.5, lines 60-63 stating that " The calculation can then be performed with respect to the pilot tones related to the

group of tones within the correlation bandwidth. Emphasis added to show the plural nature of the pilot tones.

Claim Rejections - 35 USC § 103

2. Claims 24-28, 5-7,14,18,20 are rejected under 35 U.S.C. 103(a) as obvious over Espax et al (US 6,373,433 previously cited).

Claim 24.

Expax et al discloses a method for transmitting OFDM symbols by using a plurality of OFDM subcarriers in an OFDM transmission system (see col.4, lines 25-35), comprising the steps of:

generating the OFDM signals to be transmitted by using a plurality of antenna elements (4,5,6),

obtaining channel response vectors corresponding to the plurality of antenna elements, wherein each of the channel response vectors includes subcarrier related elements corresponding to a selected set of subcarriers (see col.5, lines 43-45, 61-63 and 65-67 in particular), and

applying weighting value to each of said selected of subcarriers in accordance with a complex conjugate of the channel response vectors. See col. 6, lines 20-25.

It is obvious that since not all the sub-carriers are processed the transmitted signal quality after weight adjustment can not be as best as it can be, although the transmission overhead is reduced. Thus, it would have been obvious to one skilled in the art at the time the invention was made to measure the frequency response of all of the plurality of sub-carriers and apply appropriate weights to the plurality of the sub-carriers in accordance with a complex conjugate of

the channel response vectors in order to increase the transmission signal quality. See col. 6, lines 55-58.

Claims 25 and 26.

Espax et al discloses a method and apparatus for transmitting an orthogonal frequency division multiplex (OFDM) signal by using a plurality of antenna elements (4,5,6) at a base station (1) in a wireless transmission system, wherein the OFDM signal comprises a plurality of subcarriers, comprising:

detecting frequency channel characteristics of each subcarrier of the OFDM signal for each of said plurality of antenna elements (see col. 5, lines 61-63),

adjusting at least one of the amplitude and phase of each subcarrier in accordance with the detected characteristics of a selected set of subcarriers (see col. 6, lines 23-24 and note that, although a weight adjustment for a sub-band comprising of a plurality of sub-carriers is taught as preferable because of low overhead, this description effectively describes an embodiment, albeit less desirable, applying weights to respective sub-carriers individually), and

transmitting the OFDM signal by using the adjusted subcarriers via said plurality of antenna elements.

It is obvious that since not all the sub-carriers are processed the transmitted signal quality after weight adjustment can not be as best as it can be, although the transmission overhead is reduced. Thus, it would have been obvious to one skilled in the art at the time the invention was made to measure the frequency response of all of the plurality of sub-carriers and apply appropriate weights to the plurality of the sub-carriers in accordance with a complex conjugate of

the channel response vectors in order to increase the transmission signal quality. See col. 6, lines 55-58.

Further respect to claim 26 requiring the same transmission device detecting the channel characteristics of the sub-carriers, as opposed at the receiving device, it is well known in the art that the channel characteristics can be measured at either transmitting or receiving device since they produce the same result in many circumstances.

Claims 27 and 28.

The detected frequency characteristics are subcarrier channel response vectors. See col.5, lines 65-67.

Claims 5 and 18.

The phase of each of sub-carriers could be adjusted in response to detected frequency channel characteristics since the applied weights affects both the gain (in turn, amplitude) and phase. See col. 5, lines 43-45.

Claim 6.

The application of weights to respective antennas amounts to selecting an antenna having the best channel characteristics since antennas with highly poor channel characteristics would not be used.

Claim 7.

The application of weights to respective antennas amounts to distributing power of the transmission signal to all of the plurality of antenna elements since the weights include the amplitude gain adjustment.

Claim 14.

Espax et al teaches probing signals, i.e., "pilot symbols," for determining channel response.

Claim 20.

The transmitter (1) reads on the base station.

Claim Rejections - 35 USC § 102

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 24,25,6, 7, 14 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Greenstein et al (US 6,131,016 cited previously).

Claim 24.

Greenstein et al discloses a method for transmitting OFDM symbols by using a plurality of OFDM subcarriers in an OFDM transmission system, comprising the steps of:

generating the OFDM signals to be transmitted (see col. 3, lines 35-37) by using a plurality of antenna elements (16,17),

obtaining channel response vectors corresponding to the plurality of antenna elements, wherein each of the channel response vectors includes subcarrier related elements corresponding to the plurality of subcarriers (see col.4, line 53 ~ col.5, line 37 describing the obtaining of various channel response vectors), and

applying weighting value to each of said plurality of subcarriers in accordance with a complex conjugate of the channel response vectors. See col.5, lines 30-33.

Claims 14, 18, 20, 25.

Greenstein et al discloses a method and apparatus for transmitting an orthogonal frequency division multiplex (OFDM) signal by using a plurality of antenna elements (16,17) at a base station (10) in a wireless transmission system, wherein the OFDM signal comprises a plurality of subcarriers, comprising:

detecting frequency channel characteristics of each subcarrier of the OFDM signal for each of said plurality of antenna elements (see col. 4, line 20 ~ col. 6, line 10),

adjusting at least one of the amplitude and phase of each subcarrier in accordance with the detected characteristics of the corresponding subcarrier frequency channel or all subcarrier frequency channels (see col. 4, lines 1-12), and

transmitting the OFDM signal by using the adjusted subcarriers via said plurality of antenna elements.

It should be noted that the down link tones are grouped into subsets of M consecutive tones (where M is an odd number) such that Mx(tone spacing) is less than the correlation band. An extreme case is that each tone is selected as a pilot tone, thus meeting the limitation of "detecting frequency channel characteristics of each subcarrier of the OFDM signal." See col.5, line 45 ~ col.6, line 10.

Claim 6.

Greenstein et al discloses selecting an antenna element having the best channel characteristics. See col. 4, line 59 ~ col.5, line 7.

Claim 7.

Greenstein et al discloses distributing the power of the transmission signal to all of the antennas according to subcarrier frequency characteristics of a corresponding antennal element. See col. 5, lines 24-37.

4. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Greenstein et al (US 6,131,016 cited previously).

Greenstein et al discloses a method and apparatus for transmitting an orthogonal frequency division multiplex (OFDM) signal by using a plurality of antenna elements (16,17) at a base station (10) in a wireless transmission system, wherein the OFDM signal comprises a plurality of subcarriers, comprising:

detecting frequency channel characteristics of each subcarrier of the OFDM signal for each of said plurality of antenna elements (see col. 4, line 20 ~ col. 6, line 10),

adjusting at least one of the amplitude and phase of each subcarrier in accordance with the detected characteristics of the corresponding subcarrier frequency channel or all subcarrier frequency channels (see col. 4, lines 1-12), and

transmitting the OFDM signal by using the adjusted subcarriers via said plurality of antenna elements.

It should be noted that the down link tones are grouped into subsets of M consecutive tones (where M is an odd number) such that Mx(tone spacing) is less than the correlation band. An extreme case is that each tone is selected as a pilot tone, thus meeting the limitation of "detecting frequency channel characteristics of each subcarrier of the OFDM signal." See col.5, line 45 ~ col.6, line 10.

Further, with respect to the requiring the same transmission device detecting the channel characteristics of the sub-carriers, as opposed at the receiving device, it is well known in the art that the channel characteristics can be measured at either transmitting or receiving device since they produce the same result in many circumstances.

5. Claims 8 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greenstein et al or Espax et al, as applied to claims 25 and 26 above respectively, in view of Minami et al (US 6,587,510 previously cited).

Greenstein et al or Espax et al discloses all the subject matter claimed, as explained above, but for limiting an adjustment of the magnitude of the subcarrier signal to an upper threshold.

Minami et al teaches limiting the adjustment of transmission power to an upper threshold for the purpose of maintaining a proper carrier to interference ratio. See col. 6, lines 15-25. Thus, it would have been obvious to one skilled in the art at the time the invention was made to limit an adjustment of the magnitude of the subcarrier signal to an upper threshold when the amplitude is adjusted in response to detected channel characteristics in the system of Greenstein et al or Espax et al for the purpose of maintaining a proper carrier to interference ratio, as taught by Minami et al.

6. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Greenstein et al or Espax et al, as applied to claim 25 above, in view of Ocenasek et al (US 6,674,324 cited previously).

Greenstein et al or Espax discloses all the subject matter claimed, as explained above, but for a computer software program configured to implement the method defined in claim 25 when

run on a computing device of a transmitting device. However, a software implementation of a method performed by a hardware, using a program and a computer, is notoriously well known in the art, as evidenced by Ocenasek et al describing a device in the same field of endeavor (see col. 15, lines 35-44) and thus would have been obvious to one skilled in the art at the time the invention was made as an alternative implementation.

Allowable Subject Matter

7. Claims 2-4, 9-13 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Y. Kim whose telephone number is 571-272-3039. The examiner can normally be reached on 8AM --5PM M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on 571-272-2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

April 16, 2007

AU 2611

KEVIN KIM
PRIMARY PATENT EXAMINER